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Polymerizable solid aliphatic polyurethanes containing olefinically unsaturated double bonds and based on linear diisocyanates and use thereof

5 **Claims**

- Sub A1*
1. A polymerizable solid aliphatic polyurethane containing olefinically unsaturated double bonds, having a very narrow melting range within the temperature range from 40 to 200°C, which is preparable from
 - A) at least one linear aliphatic diisocyanate,
 - B) at least one aliphatic compound containing at least two isocyanate-reactive functional groups and/or water, and
 - C) at least one olefinically unsaturated compound containing an isocyanate-reactive functional group.
 2. The aliphatic polyurethane of claim 1, characterized in that it has a melting range from 0.5 to 10°C, in particular from 1 to 6°C.
 3. The aliphatic polyurethane of claim 1 or 2, characterized in that it has a sharp melting point.
 4. The aliphatic polyurethane of one of claims 1 to 3, characterized in that it has a very narrow melting range or a sharp melting point in the temperature range from 60 to 185°C.
 5. The aliphatic polyurethane of one of claims 1 to 4, characterized in that it contains terminal and/or

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lateral, especially terminal, olefinically unsaturated double bonds.

6. The aliphatic polyurethane of claim 5,
5 characterized in that the olefinically unsaturated double bonds are present in (meth)acrylate, vinyl ether, vinyl ester, allyl, allyl ether and/or allyl ester groups, preferably methacrylate and/or acrylate groups, especially acrylate groups.
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7. The aliphatic polyurethane of one of claims 1 to 6, characterized in that the linear aliphatic diisocyanate A) represents a monomeric diisocyanate and/or an oligomeric or polymeric diisocyanate
15 preparable from
- A) at least one linear aliphatic diisocyanate and
B) at least one aliphatic compound containing at
20 least two isocyanate-reactive functional groups.
8. The aliphatic polyurethane of one of claims 1 to 7, characterized in that the isocyanate-reactive functional groups are amino groups, thiol groups and/or hydroxyl groups, preferably amino groups and/or hydroxyl groups, particularly hydroxyl groups.
25
9. The aliphatic polyurethane of claim 8,
characterized in that the aliphatic compound B) is
30 linear.
10. The aliphatic polyurethane of claim 9, that the linear aliphatic compound B) is a diamine, triamine, amino alcohol containing at least one amino group and at least one hydroxyl group, diol, triol, tetrol and/or sugar alcohol.
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11. The aliphatic polyurethane of claim 10,
characterized in that a low molecular weight diol,
triol or a tetrol or a sugar alcohol having a molecular
weight of from 62 to 200 daltons and/or a linear
5 aliphatic oligomeric and/or polymeric polyesterdiol
and/or polyetherdiol is used as linear aliphatic
compound B).
12. The aliphatic polyurethane of one of claims 1 to
10 11, characterized in that
- (1) at least one diisocyanate A) is reacted with at
least one compound C) in a molar ratio A) : C) of
15 1 : 1 to give an adduct A/C) containing one
isocyanate group and one olefinically unsaturated
group, and then
- (2) the adduct A/C) is reacted with at least one
compound B) in a molar ratio A/C) : B) of x : 1,
20 wherein x is the number of the isocyanate-reactive
groups in the at least one compound B), to give
the aliphatic polyurethane.
13. The aliphatic polyurethane of one of claims 1 to
25 11, characterized in that
- (1) at least one diisocyanate A) is reacted with at
least one compound B) in a molar ratio A) : B) of
30 x : 1, wherein x is the number of the isocyanate-
reactive groups in the at least one compound B) to
give the adduct A/B) containing x isocyanate
groups, and then
- (2) the adduct A/B) is reacted with at least one
35 compound C) in a molar ratio C) : A/B) of x : 1,
wherein x is the number of the isocyanate groups

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in the adduct A/B) to give the aliphatic polyurethane.

14. The aliphatic polyurethane of claim 12 or 13,
5 characterized in that x is a number, in particular a whole number, from 2 to 6.

15. The aliphatic polyurethane of one of claims 1 to 10, characterized in that its soft phase has a glass transition temperature $T_g < 25^\circ C$.

16. Use of the aliphatic polyurethane according to one of claims 1 to 15 as powder coating material or for preparing powder coating materials.
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17. A powder coating material curable thermally and/or with actinic radiation which comprises or consists of at least one aliphatic polyurethane according to one of claims 1 to 15.
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18. The powder coating material of claim 17, characterized in that it further comprises oligomers and/or polymers which are curable thermally and/or with actinic radiation and have a glass transition 25 temperature T_g of more than $40^\circ C$.

19. The powder coating material of claim 17 or 18, characterized in that it further comprises customary coatings additives.
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20. The powder coating material of one of claims 17 to 19, characterized in that it is in the form of a powder slurry coating material.

35 21. A coating producible from a powder coating material according to one of claims 17 to 20.

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28. Primed and unprimed substrates, especially bodies of automobiles and commercial vehicles, industrial components, including plastics parts, packaging, coils, and electrical components, or furniture, comprising at 5 least one coating according to claim 20.
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